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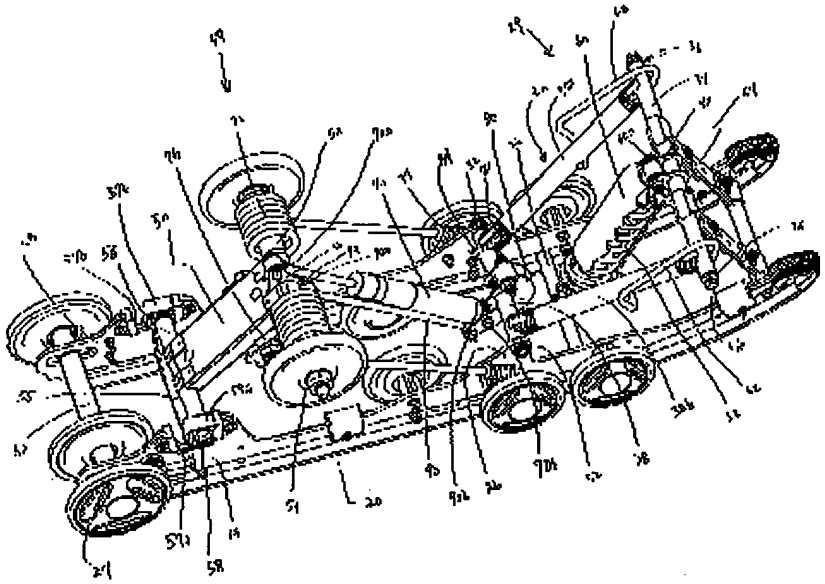
(54) A SHOCK LINKAGE ASSEMBLY FOR A SNOWMOBILE REAR SUSPENSION SYSTEM

(54) UN ASSEMBLAGE DE LIAISON DE CHOC POUR UN SYSTEME DE SUSPENSION ARRIERE DE MOTONEIGE

Representative Drawing:



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ABSTRACT:
The present invention provides a snowmobile suspension system comprising a slide frame for engagement with a lower portion of an endless track carried on a suspension assembly, where the suspension assembly comprises a front suspension arm having an upper portion adapted to be pivotally attached to the chassis and a lower portion pivotally attached to the slide frame. A rocker arm is pivotally attached at one end to a bracket arm, which in turn in fixedly connected to the front suspension arm. The other end of the rocker arm extends

rearwardly and beneath the lower portion of the front suspension arm for pivotal engagement with the lower ends of a rear shock absorber and a location rod. The upper ends of the rear shock absorber and location rod are pivotally connected to the upper portion of the rear suspension assembly, which is pivotally mounted relative to the snowmobile chassis.

CLAIMS: Show all claims

*** Note: Data on abstracts and claims is shown in the official language in which it was submitted.

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A SHOCK LINKAGE ASSEMBLY FOR A SNOWMOBILE REAR SUSPENSION SYSTEM

FIELD OF THE INVENTION

This invention relates to a rear shock linkage system for a suspension system of a snowmobile.

BACKGROUND OF INVENTION

Tracked vehicles such as snowmobiles have rear suspension systems generally consisting of front and rear suspension arms pivotally mounted on shafts, which are rotatably connected to the frame of the snowmobile, and a slide frame, which comprises a pair of laterally spaced apart slide rails or longitudinal skids interconnected transversely on opposing lateral sides of the machine. The slide rails are in sliding contact with an endless belt which provides ice and snow surface contact and a friction drive for the snowmobile.

In many current arrangements, front and rear suspension arms pivotally interconnect the chassis to the slide frame. In one typical arrangement, the rear suspension system includes pair of shock absorbers pivotally connected to the chassis, extending downward to a pivoting position that is connected to the slide frame by connecting parts. Also, to attach the rear shock absorber to the pivoting shaft, the conventional approach is to pivotally attach the shock absorber to a bracket arm that is fixedly connected to the pivoting shaft. Such a system is shown in U.S. Pat. No. 5,664,649 to Thompson et al.

In the above arrangement, it is preferable to make the bracket arm as short as possible so that the shock absorber is attached at the lowest possible point to thereby provide greater suspension travel within the endless belt. However, a short bracket arm length creates the possibility that the shock absorber will become jammed with other suspension components

and/or belt during large angular displacements of the pivoting shaft, and, correspondingly, the bracket arm. Therefore, a short bracket arm length limits flexibility in the design of the suspension linkage system.

One way to alleviate the concerns over the restriction on the design options and also provide for sufficient shock absorber travel is to attach the shock absorber to an end of an additional component that permit a higher or lower pivoting point for the additional component. Such a prior art system is shown in FIG. 1. Here, shock absorber 1 is attached to a rocker arm 2, which is pivotally attached via a bolt 3 to an addition component designated as plate bracket 4. Plate bracket 4 is in turn fixed to tube 5, which is fixed to the slide frame. Because of the large forces experienced by the system, plate bracket 4 and rocker arm 2 require additional support. To provide such support, plate bracket 4 includes a C-shaped portion 6, that is more clearly shown in the exploded view in FIG. 1a. This C-shaped portion 6 is in sliding contact with transverse portion 8 of rocker arm 7. Thus, plate bracket 4 is supported at both ends for additional strength. As can be seen from FIG. 1, shock absorber 1 is thus attached to a low position that allows for sufficient suspension travel. Because rocker arm 2 is long and can pivot freely about pivot 3, the concerns about the restrictions in the suspension linkage system is eliminated.

However, the prior art apparatus shown in FIG. 1 has three problems. First, the added components of the plate bracket 4, and support tube 5 add weight. Second, the forces involved combined with the friction between the C-shaped portion 6 and transverse portion 8 create significant wear of both the transverse portion 8 and the C-shaped portion 6. Third, because of the forces between the C-shaped portion 6 and the transverse portion 8, "stiction" occurs between the two components preventing free movement of the front suspension arm, thereby reducing the overall performance of the suspension system.

SUMMARY OF THE INVENTION

It is the object of the present invention, therefore, to overcome the problems associated with the prior art noted above. In achieving this object, the present invention provides a snowmobile suspension system comprising a slide frame for engagement with a lower portion of an endless track carried on a suspension assembly, where the suspension assembly comprises a front suspension arm having an upper portion adapted to be pivotally attached to the chassis and a lower portion pivotally attached to the slide frame. Further, a rocker arm is pivotally attached at one end to a bracket arm, which in turn in fixedly connected to the front suspension arm. An other end of the rocker arm extends rearwardly and beneath the lower portion of the front suspension arm for pivotal engagement with a rear shock absorber and a location rod. With this arrangement, fewer parts are required, thereby reducing the complexity and weight of the system, and the wear and stiction problems associated with the prior art are eliminated.

Other objects and advantages of the present invention will be realized in accordance with the following detailed description, appended drawings and claims.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 shows a prior art suspension system which utilizes a rocker arm, a plate bracket, and a C-shaped support portion for additional support;

FIG. 1a illustrates an expanded view of a portion of the prior art system shown in FIG. 1;

FIG. 2 shows an overall view of a snowmobile with its major components;

FIG. 3 shows a perspective view of the preferred embodiment of the snowmobile suspension system of the present invention; and

FIG. 4 shows a two dimensional view of FIG. 3.

DETAILED DESCRIPTION OF THE DRAWINGS

Throughout the following detailed description, like reference numerals are used to refer to the same element of the invention shown in multiple figures thereof. As shown in FIG. 2, a snowmobile is generally shown at 10 having a body on chassis 12 that mounts a seat 14 on the upper side thereof. A rear suspension and endless track assembly is generally indicated at 18.

The engine (not shown) has a drive belt or other system (not shown) that transmits engine torque to main drive wheels or sprockets 41 which drivingly engage an inner drive surface of the track 16. As more clearly seen in FIGS. 3 and 4, rear track support wheels 24 are supported on the slide rails 28 of slide frame 20 by an axle shaft 32.

Referring to FIGS. 3 and 4, the rear suspension system of the snowmobile 10 comprises a slide frame 20 that is connected to the chassis 12 through the front and rear suspension assemblies generally indicated as 29 and 49, respectively. Each of the front and rear suspension assemblies 29, 49 comprises, among other things, front and rear suspension arms 30 and 50, respectively, and front and rear shock absorbers 60 and 70, respectively. In the embodiment shown in FIG. 3, the rear shock absorber 70 is preferably of the piston-damper type, while the front shock absorber 60 of the coil-over piston-damper type. The slide frame 20 comprises two longitudinally extending transversely spaced apart slide rails 28 that are transversely interconnected by suitable cross structures to form a generally rigid structure. The lower surfaces of the slide rails 28 are coated in a known manner with a

suitable low friction material such as nylon, Teflon®, and preferably UHMW, for sliding contact with the track belt 16.

As shown in FIG. 3, front and rear suspension arms 30 and 50, respectively, interconnect the slide rails 28 with the chassis 12. The front suspension arm 30 is a trapezoidally-shaped structure that includes an upper tube portion 34 and a lower tube portion 38 that are connected by two tubes 30a and 30b. In the preferred embodiment, the components are all welded together to form an integral structure. The upper portion 34 of front suspension arm 30 is pivotally mounted on a first transverse shaft (not shown) that is fixedly or pivotally attached to the chassis 12 by means of bolts 34a. Likewise, the lower tube portion 38 of front suspension arm 30 is pivotally mounted on a second transverse shaft (not shown) that is fixedly attached to the respective slide rails 28. Therefore, as the slide frame 20 displaces vertically, front suspension arm 30 is able to pivot about the first transverse shaft relative to the chassis 12 and simultaneously pivot about the second transverse shaft relative to the slide frame 20.

A front shock absorber 60 extends from the upper tube portion 34 of the front suspension arm 30 downwardly and rearwardly to fixedly connect to a lower transverse shaft 22, which is fixedly attached to slide rails 28 by bolts 60b, as shown in FIG. 4. The front shock absorber 60 is pivotally attached to a bracket arm 42 by a bolt 60a. Bracket arm 42 is in turn fixedly connected to the upper tube portion 34 of front suspension arm 30.

The rear suspension assembly 49 comprises, among other things, a rear suspension arm 50, a shock absorber 70, and a location rod 90. The rear suspension arm 50 comprises a transverse rear upper tube that is pivotally mounted on a third transverse shaft (not shown), which is connected to the chassis 12 by bolt 54, as shown in FIG. 3. Rear suspension arm 50 made of the transverse rear upper tube and extends downwardly and rearwardly to the

transverse rear lower tube 56. The transverse rear lower tube 56 is connected to a lower arm 55 which is in turn pivotally connected to the slide frame 20. The axial ends of the rear lower tube 56 have blocks 59a and 59b which are movable within the block stoppers 57a and 57b on the slide frame 20.

A rear shock absorber 70 extends from the transverse rear upper tube downwardly and forwardly to pivotally attach to a rocker arm 80, which will be discussed below. The other end of the rear shock absorber 70 is pivotally attached to a bracket arm 40 by a bolt 70a. Bracket arm 40 is in turn fixedly connected to the transverse rear upper tube. Additionally, the rear suspension assembly 49 further comprises a location rod 90 that at one end is pivotally attached to rocker arm 80 by a bolt 90b. The location rod 90 runs adjacent the rear shock absorber 70 and is pivotally attached at its other end by a bolt 90a to bracket arm 92, which in turn is fixedly connected to the transverse rear upper tube. Therefore, as the slide frame 20 displaces vertically, rear suspension arm 50 is able to pivot about the third transverse shaft relative to the chassis 12.

Biasing elements are provided in both front and rear suspension assemblies 29 and 49, respectively, for urging the slide rails 28 away from the chassis 12. The biasing elements on the rear suspension assembly 49 preferably include a pair of torsion springs 72 around the transverse upper front tube and bushings 52. One end 74 of each torsion spring 72 is connected to its corresponding slide rail 28 and the other end 76 of each is engaged with the rear suspension arm 50. The biasing element on the front suspension assembly 29 includes a helical spring 63 that is incorporated into the shock absorber 60. A pair of extension limiters, such as straps 64 shown in FIG. 3, is used to prevent over-extension of the slide rails 28 by the springs 62, 63, and 72.

As mentioned earlier, the rear shock absorber 70 extends downwardly and forwardly to pivotally attach to rocker arm 80. Rocker arm 80 and its attachment to the front suspension arm 30 represent the major component of the invention. Rocker arm 80 is made of two spaced apart flat plates which, when connected, together form one rocker arm 80. Of course, an integral cast, forged or manufactured rocker arm 80 can also be used. One end of rocker arm 80 is pivotally attached to bracket arm 84 by a bolt 82, and bracket arm 84 is in turn fixedly connected to the transverse lower tube portion 38 of the front suspension arm 30. Rocker arm 80 curls around and extends rearwardly beneath tube portion 38. Pivotally attached to the other end of rocker arm 80 are the lower end of the rear shock absorber 70 by a bolt 70b and the lower end of the location rod 90 by a bolt 90b. Bushings can be provided at one or more of the rocker arm/bracket arm, rocker arm/shock absorber and rocker arm/location rod pivot joints, as is known, to reduce friction between the components during operation. The positioning of bracket arm 84 is designed so that when the displacement of the slide frame 20 has reached it maximum compression point, i.e., bottomed out, the top of bracket arm 84 is close to or touches the underside of the snowmobile track 16 that is to have the longest rocker arm possible. It can be appreciated that the orientation angle between the bracket arm 84 and the front suspension arm 30 remains fixed, and as the front suspension arm 30 moves up vertically due to a displacement of slide frame 20, bracket arm 84 likewise moves upward and also pivotally rotates about bolt 32.

With this structure, fewer parts are required to ensure sufficient suspension travel, thereby reducing the complexity and weight of the system, while providing greater flexibility in designing the suspension linkage systems. Additionally, the rocker arm 80 linkage arrangement of this invention eliminates the wear and stiction problems associated with the prior art.

While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention is not to be limited to the disclosed embodiments and elements, but, on the contrary, is intended to cover various modifications, equivalent arrangements, and equivalent elements included within the spirit and scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS.

1. A snowmobile rear suspension system comprising:

a slide frame for engagement with a lower portion of an endless track carried on a suspension assembly, said suspension assembly comprising

a front suspension arm having an upper portion adapted to be pivotally mounted relative to a chassis and a lower portion pivotally mounted relative to said slide frame;

a rocker arm having a first end and a second end, said first end being pivotally attached to said front suspension arm and said second end being pivotally attached to a shock absorber and a locating rod.

2. A snowmobile suspension system as claimed in claim 1, wherein said suspension assembly is a front suspension assembly, and said rear suspension system further comprises a rear suspension assembly, said rear suspension assembly comprising a rear suspension arm having an upper portion that is pivotally mounted relative to said chassis and a lower portion pivotally mounted relative to said slide frame.

3. A snowmobile suspension system as claimed in claim 1, wherein said shock absorber is a rear shock absorber that is downwardly and forwardly angled, said rear shock absorber having an upper end and a lower end, said upper end being pivotally attached to said upper portion of said rear suspension arm and said lower end being pivotally attached to said second end of said rocker arm.

4. A snowmobile suspension system as claimed in claim 1, wherein said location rod has an upper end and a lower end, said upper end being pivotally connected to said upper portion of said rear suspension arm and said lower end being pivotally attached to said second end of said rocker arm.

5. A snowmobile suspension as claimed in claim 1, further comprising a front shock absorber having an upper end and a lower end, said upper end being pivotally connected said upper portion of said front suspension arm and said lower end being pivotally connected to said slide frame.

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ABSTRACT OF THE DISCLOSURE

The present invention provides a snowmobile suspension system comprising a slide frame for engagement with a lower portion of an endless track carried on a suspension assembly, where the suspension assembly comprises a front suspension arm having an upper portion adapted to be pivotally attached to the chassis and a lower portion pivotally attached to the slide frame. A rocker arm is pivotally attached at one end to a bracket arm, which in turn in fixedly connected to the front suspension arm. The other end of the rocker arm extends rearwardly and beneath the lower portion of the front suspension arm for pivotal engagement with the lower ends of a rear shock absorber and a location rod. The upper ends of the rear shock absorber and location rod are pivotally connected to the upper portion of the rear suspension assembly, which is pivotally mounted relative to the snowmobile chassis.

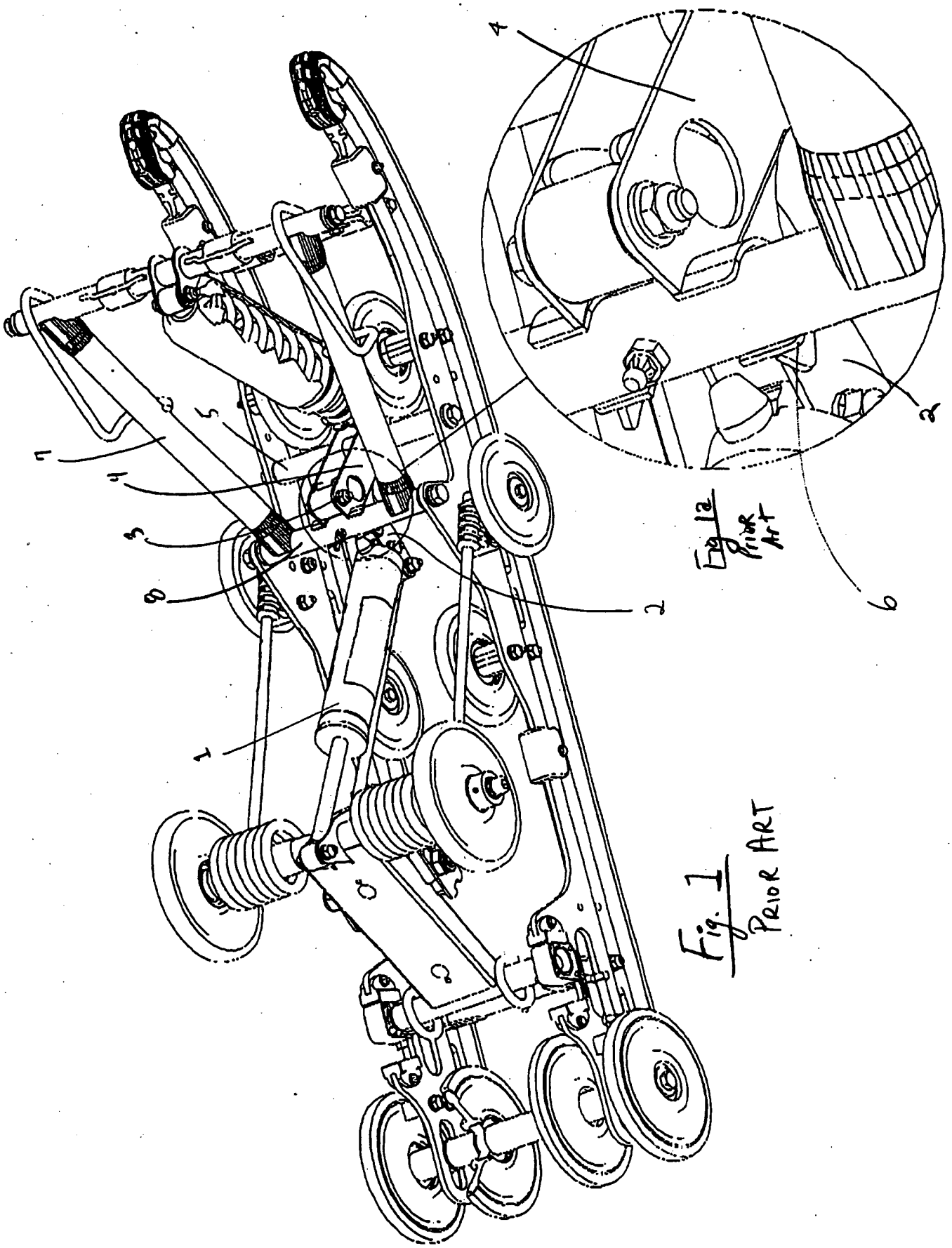


Fig 1a
Prior Art

Fig. 1
PRIOR ART

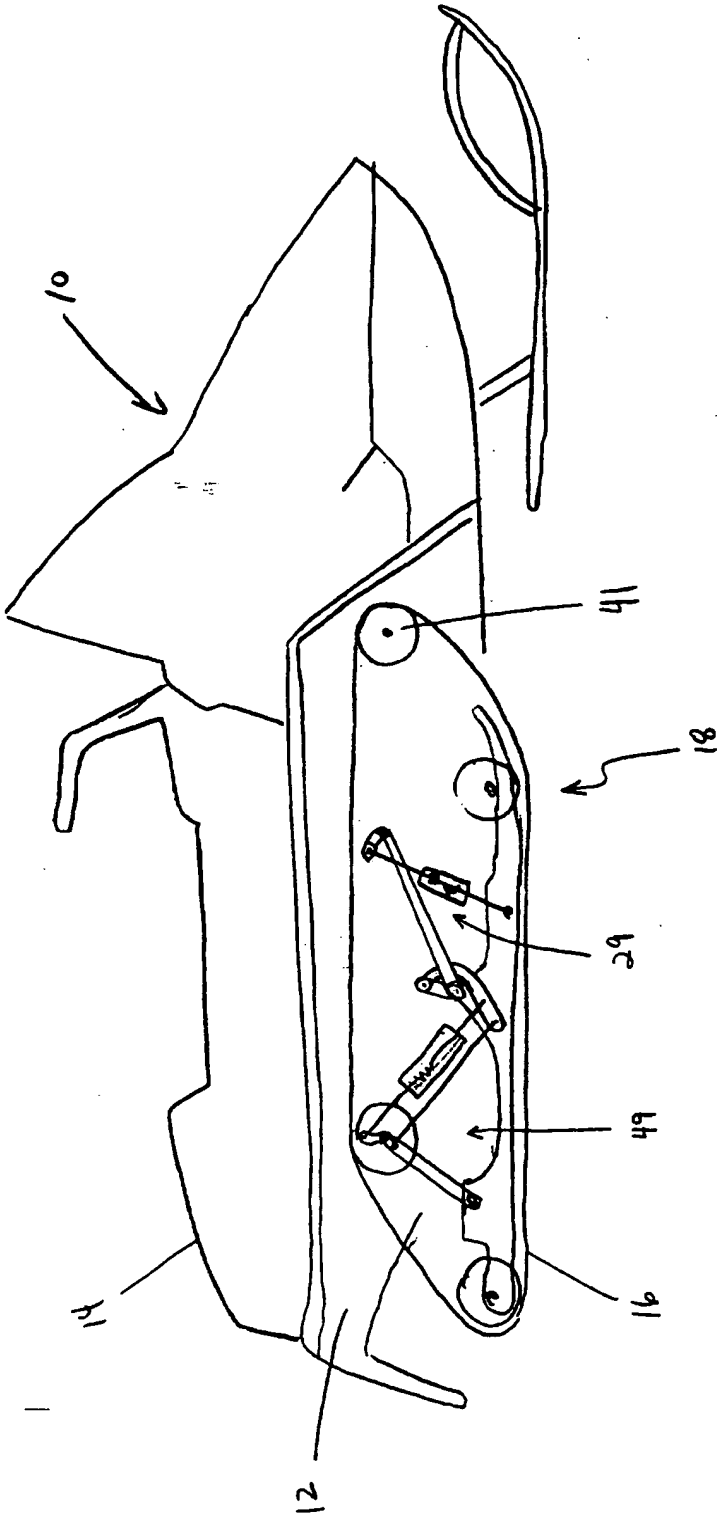


Fig. 2

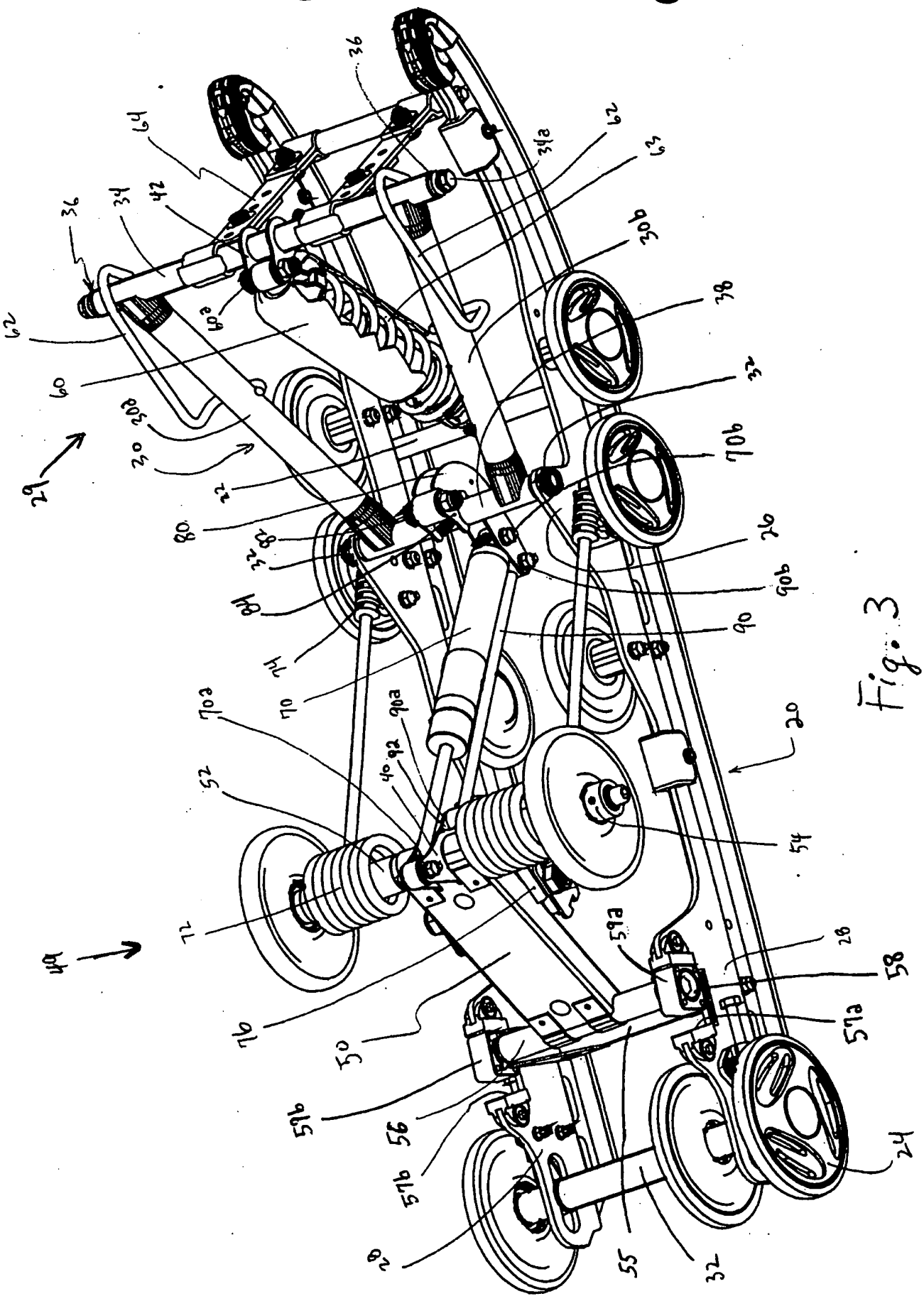
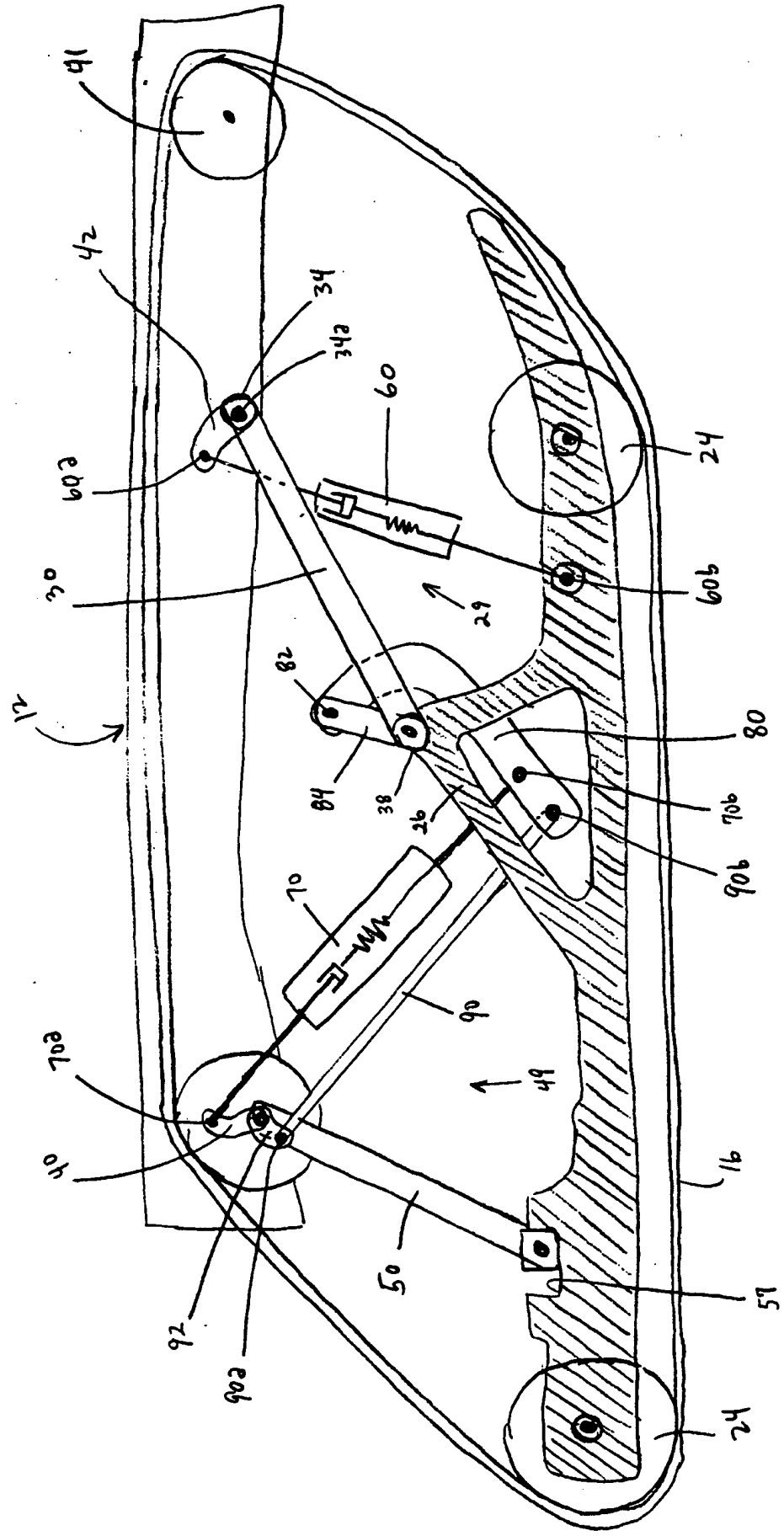


Fig. 3


18
42
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34a
60
60a
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29
60b
82
21
80
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38
26
70b
90b
70
90
70a
49
16
50
58
92
90a
24

Fig. 4